

## FOOD

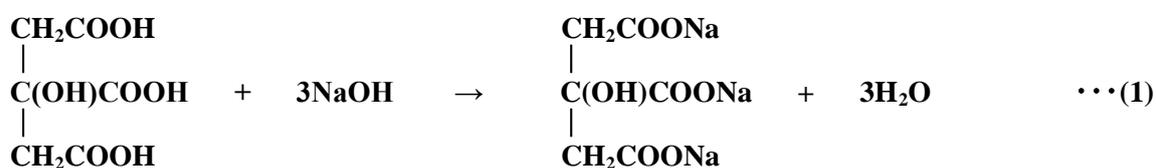
## Acid value measurement of orange juice

**1. Abstract**

An example for acid value measurement of orange juice performed by neutralization titration is introduced here.

Dispense the sample and add pure water. Titrate with sodium hydroxide standard solution until the pH reaches 8.1 using a glass electrode (neutralization titration). Acid value is calculated by the standard solution volume titrated until the pH reaches 8.1 as the citric acid content.

Reaction between citric acid and sodium hydroxide is described by the following formula (1).

**2. Configuration of instruments and Reagent**

## (1) Configuration

Main unit : Hiranuma Automatic Titrator COM series

Electrodes : Glass electrode GE-101B

Reference electrode RE-201Z

Thermistor electrode TE-403

\* The glass/reference combination electrode is usable instead of glass electrode and reference electrode. The glass/reference combination electrodes are listed below.

- GR-501BZ (Fixed sleeve type)
- GR-511BZ (Movable sleeve type)

## (2) Reagent

Titrant : 0.1 mol/L sodium hydroxide standard solution

**3. Measurement procedure**

## (1) pH calibration

The pH calibration should be performed with neutral phosphate (pH 6.86) and borate (pH 9.18) pH standard solution.

## (2) Acid measurement

- i) Dispense 1~5 g of the sample into a 200 mL beaker and accurately weigh it.
- ii) Add pure water to make about 100 mL of solution.
- iii) Immerse the electrodes and start to titrate with sodium hydroxide standard solution. Perform it until the pH reaches 8.1.
- iv) Measure the blank in a similar way to the above procedure without sample.

## 4. Measurement condition and Results

### Example of titration condition

#### Measurement of blank

Cndt No.	1	ConstantNo.	1	Mode No.	14
Method	Set	Size	0.0 g	Pre Int	0 sec
Buret No.	1	Blank	0.0 mL	Del K	0
Amp No.	1	Molarity	0.1 mol/L	Del Sens	0 mV
D. Unit	pH	Factor	1.005	Int Time	3 sec
S-Timer	5 sec	K	0.0	Int Sens	3 mV
C.P. mL	0 mL	L	0.0	Brt Speed	2
Direction	↑	Unit	mL	Pulse	8
D.P. mL	0.0 mL	Formula	D		
End Point pH	8.10 pH	Digits	3		
Over mL	0.0 mL	Auto In Pram.	Non		
Max.Vol.	1 mL				

#### Measurement of sample

Cndt No.	2	ConstantNo.	2	Mode No.	5
Method	Set	Size	2.6328 g	Pre Int	0 sec
Buret No.	1	Blank	0.02 mL	Del K	5
Amp No.	1	Molarity	0.1 mol/L	Del Sens	0 mV
D. Unit	pH	Factor	1.005	Int Time	3 sec
S-Timer	10 sec	K	64	Int Sens	3 mV
C.P. pH	6.0 pH	L	0.0	Brt Speed	2
Direction	↑	Unit	%	Pulse	40
D.P. pH	6.5 pH	Formula	$(D-B)*K*F*M/(S*10)$		
End Point pH	8.10 pH	Digits	3		
Over mL	0.10 mL	Auto In Pram.	Non		
Max.Vol.	20 mL				

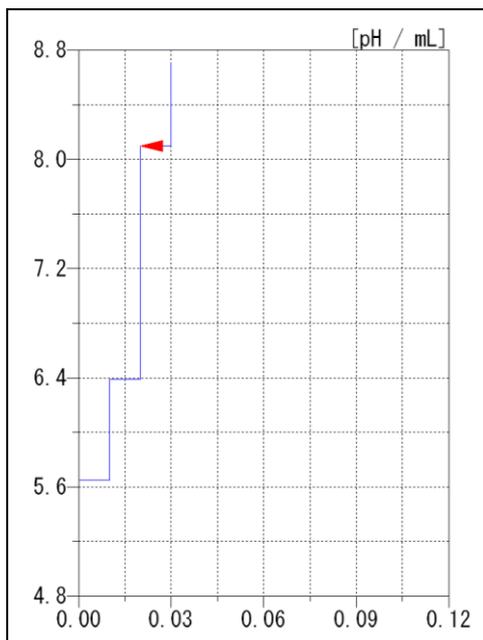
### Measurement results

#### Measurement of blank

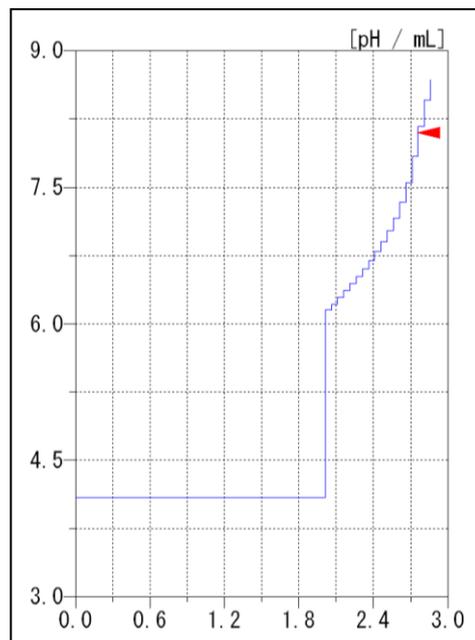
Number of measurement	Size (g)	Titer (mL)
1	—	0.020
2	—	0.019
3	—	0.021
Average (Blank)		0.020 mL

#### Measurement of sample

Number of measurement	Size (g)	Titer (mL)	Acid value (%)
1	2.6210	2.782	0.678
2	2.5853	2.743	0.677
3	2.5920	2.751	0.678
Average			0.678
Standard deviation			0.001
Coefficient of variation			0.085



Blank measurement



Sample measurement

### Examples of titration curves

## 5. Note

### (1) pH calibration

The pH calibration is quite important because pH 8.1 is detected as the endpoint by set-endpoint detection on the acid value measurement. It must be calibrated before the measurement one time per a day at least.

The pH is sensitive to the temperature, the use of a thermistor electrode for temperature compensation is recommended to measure pH more accurately.

### (2) Reduction of measurement time

When using the function "CP pH", the titrant is continuously added until the pH reaches the set value (pH 6.0 here). The measurement time can be reduced by this function.

For example, the measurement time was about 4 minutes without using CP pH on this measurement. However, it was 2 minutes when using CP pH. CP pH availability depends on the sample, please appropriately use it considering the sample.

Keyword : Acid value, Orange Juice, Neutralization Titration, Fruit drink, pH calibration

\*Some measurement would not be possible depending on optional configuration of system.